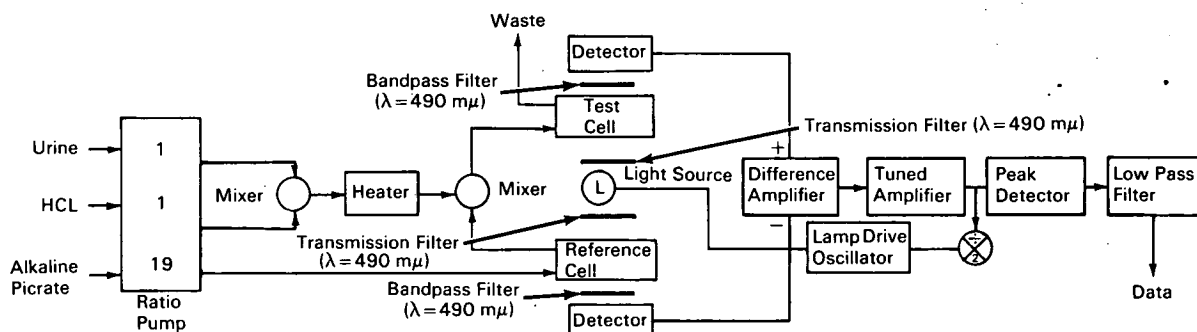


NASA TECH BRIEF



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Automated Urinalysis Technique Determines Concentration of Creatine and Creatinine by Colorimetry



The problem:

To develop a continuous urinalysis technique for the determination of creatine and creatinine which are of interest in the study of muscle wastage in primates. Muscle wastage is one of the factors being studied in the biosatellite mission as an indicator of the effect of weightlessness. Existing urinalysis instruments and techniques require more equipment and operations than can be reasonably accommodated in a satellite. It was necessary to devise smaller equipment and simpler techniques.

The solution:

Creatinine concentration in urine is determined in an aliquot mixture of the urine with alkaline picrate by a color reaction. Creatine is determined in a second aliquot by first converting it to creatinine by heating in an acid solution. The difference in values of the color intensity between the two aliquots represents the urinary creatine. Electronic circuits produce digital signals of the initial creatinine measurement, the subsequent measurement, and of the difference

between them and transmits these data by radio to ground stations.

How it's done:

The analysis is carried out in a modified dual beam colorimeter. The cells are illuminated from a common source through bandpass filters peaked at 490 millimicrons. At this wavelength the absorbancy of the reaction products is directly proportional to the concentration of creatinine.

The alkaline picrate solution (25% saturated picrate, 0.25N sodium hydroxide, and 0.45% sodium chloride) is first measured in a light cell to determine its absorbance at 490 millimicrons, and this measurement is then converted to a digital signal. An appropriate mixture of urine, hydrochloric acid, and alkaline picrate solution is made in the ratio pump. The absorbance of this mixture is measured at 490 millimicrons and this measurement is also converted to a digital signal. The difference between the first and second measurements represents creatinine concentration in the urine.

(continued overleaf)

To determine creatine, an aliquot of urine is mixed with hydrochloric acid in the ratio pump as in the previous test and is heated at 100°C for 20 minutes to convert creatine to creatinine. After the addition of alkaline picrate solution, the absorbance of this reaction mixture is also measured at 490 millimicrons. The difference between the second and third measurements represents creatine concentration in the urine. The digital data are then applied to a modulator which modulates a telemetering transmitter to transmit the data to ground stations by radio.

Notes:

1. This technique is extremely simple and requires a minimum of steps and equipment and can be readily automated.
2. The technique described here may be adapted for use in hospitals for rapid urinalysis to determine creatine and creatinine concentration, either on an individual test basis or in on-line continuous patient monitoring techniques.

3. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: B67-10245

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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(NPO-10149)